Take-All Root Rot

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Take-all root rot of wheat occurs throughout Kansas, but it is most common in the central part of the state. The disease is first detectable around the jointing stage of crop growth when affected plants are stunted and yellow compared to healthy plants. This early phase of take-all root rot usually goes unnoticed. If the disease is suspected early in the season, plants can be diagnosed in K-State's Plant Diagnostic Laboratory by the presence of the fungus on the roots and crowns.

Symptoms

After heading, the symptoms of take-all root rot are much easier to detect as whole plants begin to die and become tan prematurely (Figure 1). Plants may die individually or in large patches, and the heads often contain little or no grain. Patches of affected wheat usually occur in wetter areas of the field. Occasionally whole fields are killed, which is how take-all root rot earned its name.

Take-all root rot causes significant damage to the root system and lower portions of wheat plants. Affected plants can be pulled from the ground easily and have a characteristic dark black discoloration of the roots and the base of the stems (Figure 2). Take-all root rot can be confused with Cephalosporium stripe, drowning, dryland foot rot, strawbreaker foot rot, winter injury, and crown rot symptoms. However, only take-all root rot has shiny, dark black discoloration on the lower stems.

Quick Facts

- Take-all root rot causes wheat to die prematurely, resulting in patches of tan wheat in otherwise green fields (Figure 1). The diseased plants can be pulled from the ground easily and have a characteristic black discoloration of the lower stems and roots (Figure 2).
- Take-all root rot is most severe in continuous wheat. The fungi that cause the disease survives on crop residues but does not persist for extended periods of time. Rotation with nearly any crop other than barley or bromegrass is an effective means of control for take-all root rot. A full year of fallow also is effective at reducing the risk of severe take-all root rot.

Life Cycle

The fungus that causes take-all root rot survives between wheat crops in crop residue, on grassy weeds, and on volunteer wheat. Since the fungus is short-lived, take-all is primarily a problem in continuous wheat. Take-all root rot builds up slowly, so it is usually the third or fourth year of continuous wheat that is severely damaged.

Figure 1. *White heads plants infected with take-all root rot often occur in patches. (photo by Bill Willis)*

Figure 2. *Black discoloration of roots and lower stem is characteristic of plants infected with take-all root rot.*

In the fall, the fungus moves from the old residue onto the roots of young wheat seedlings. This requires good moisture and close contact between the old residue and the new roots. There is evidence that the fungus that causes take-all root rot also can spread to neighboring plants by root contact, which may explain why take-all occurs in patches. Take-all root rot infestations often originate from weedy grasses in ditches or waterways when pieces of infected roots and crowns are simply dragged into the field during tillage. Smooth brome, cheat, wheatgrass, and wild barleys are all possible sources. The fungus also produces airborne spores that may play a role in initiating new infections. Take-all root rot is not spread in wheat seed or by insects.

Control

The weak link in the life cycle of take-all root rot is survival between crops, making crop rotation and effective means of disease control. Any other crop makes a good rotation except barley and bromegrass since they are susceptible to take-all. A good rotation would be two years of wheat followed by one or two years of a different crop. A full year of fallow is also an effective rotation. It is important to control weedy grasses in the rotational crop, since many grasses are hosts of take-all. Take-all root rot also is influenced by soil pH and is suppressed when the pH gets much below 6.0. Unfortunately some of the most severe take-all occurs when fields of continuous wheat are limed; therefore, it is good practice to combine liming with crop rotation.

If crop rotation is not feasible, it may be possible to reduce the summer survival of the fungus that causes take-all root rot. Burning followed by one or two tillage passes will hasten the breakdown of the wheat residue. Plowing may bury the residue deep enough that the disease has trouble attacking new seedlings. Clean-tilled fields also achieve higher soil temperatures, which are detrimental to survival of take-all root rot. Of course, these methods are not appropriate for highly erodible land.

Late planting is sometimes helpful because it gives more time for the fungus that causes take-all to die out. It also leaves less time for the new seedling roots to penetrate the old residue and become infected in the fall.

Continuous wheat producers may get help from a phenomenon called "take-all decline." After disease severity peaks in the fourth or fifth year of continuous wheat, severity may begin to decline as parasites of the fungus itself become established. Afterward, take-all root rot severity usually remains low enough to avoid serious yield losses. However, just one year of rotation to a different crop will likely nullify the decline of the fungus allowing take-all root rot to remerge as a severe problem. Moreover, it could take several years to regain useful affect of the take-all decline.

Fungicide seed treatments containing the active ingredient difenoconazole (Dividend Extreme, CruiserMax Cereals) are labeled for partial control of take-all root rot. The potential level of control achieved by the fungicide is not well documented in Kansas, and producers should not depend on these products as a primary means of take-all root rot control.

Split applications of nitrogen have resulted in some suppression of take-all root rot compared to putting all the nitrogen on in the fall. Ammonia nitrogen seems to suppress take-all compared to nitrate nitrogen. Maintaining adequate levels of other nutrients helps the wheat grow new roots and partially compensate for damage to the root system.

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